



Subject card

Subject name and code	Computer assisted design, PG_00052346							
Field of study	Chemical Technology							
Date of commencement of studies	October 2021		Academic year of realisation of subject		2023/2024			
Education level	first-cycle studies		Subject group		Obligatory subject group in the field of study			
Mode of study	Full-time studies		Mode of delivery		at the university			
Year of study	3		Language of instruction		Polish			
Semester of study	6		ECTS credits		3.0			
Learning profile	general academic profile		Assessment form		assessment			
Conducting unit	Department of Process Engineering and Chemical Technology -> Faculty of Chemistry							
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Robert Aranowski					
	Teachers		dr inż. Robert Aranowski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar		
	Number of study hours	15.0	0.0	0.0	30.0	0.0		
	SUM E-learning hours included: 0.0							
Additional information: Link to supplementary materials in the e-learning system:  <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=27706">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=27706</a>								
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		SUM		
	Number of study hours	45		2.0		28.0		
		75						
Subject objectives	The aim of this course is to acquaint students with the latest software used in designing technological processes including software to perform engineering drawings, calculations and also simulation of technological processes.							
Learning outcomes	Course outcome		Subject outcome		Method of verification			
	K6_U10		Using IT tools, such as Scilab and ChemCAD, Student is able to analyse and design the process control system using feedforward and feedback regulators.		[SU4] Assessment of ability to use methods and tools			
	K6_W06		Student has the knowledge to use the appropriate software tools to solve problems in the chemical technology and process engineering field.		[SW2] Assessment of knowledge contained in presentation			
	K6_U04		Student can make the material and energy balance of the technological process in the SciLab and ChemCAD environment.		[SU1] Assessment of task fulfilment			

Subject contents	Scilab: Editor, Variable Browser and Command History; Scripts; Basics of Scilab; Variables; Multi-line commands and comments; Predefined variables; Logical variables and comparison operators; Ans; Character strings; Numeric variables; Dynamic variable typing; Conditional statements; Loops; Input-output operations.  ChemCAD: Use of flowsheeting for modeling chemical processes using ChemCAD. ChemCAD basics of the program. Creating a chemical process technology projects. Mathematical models of physicochemical properties used in ChemCAD. Simulation of mass flow, a complete simulation and optimization of steady-state. Simulating chemical processes using ChemCAD. Creating reports, and the interpretation of simulation results.												
Prerequisites and co-requisites	Computer and MS Office software basic knowledge, geometry, dimensioning												
Assessment methods and criteria	<table border="1"> <thead> <tr> <th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr> </thead> <tbody> <tr> <td>AUTOCAD/INVENTOR drawing</td><td>60.0%</td><td>33.0%</td></tr> <tr> <td>CHEMCAD problem</td><td>60.0%</td><td>33.0%</td></tr> <tr> <td>SciLab problem</td><td>60.0%</td><td>34.0%</td></tr> </tbody> </table>	Subject passing criteria	Passing threshold	Percentage of the final grade	AUTOCAD/INVENTOR drawing	60.0%	33.0%	CHEMCAD problem	60.0%	33.0%	SciLab problem	60.0%	34.0%
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Recommended reading	<p>Basic literature</p> <ol style="list-style-type: none"> <li>Pikoń J., AutoCAD 2002, Helion, Warszawa 2002.</li> <li>Tarnowski Wojciech, Symulacja komputerowa procesów ciągłych, Koszalin, Wyższa Szkoła Inżynierska w Koszalinie 1996.</li> <li>Mąkowski Mirosław, Zastosowanie i wykorzystanie symulacji komputerowej w procesie oczyszczania ścieków osadem czynnym, Zielona Góra, Wyższa Szkoła Inżynierska, 1992.</li> <li>Perkowski Piotr, Technika symulacji cyfrowej, Warszawa, Wydaw. Nauk.-Tech, 1980.</li> <li>Leigh J. R., Modelling and simulation, London, Peter Peregrinus, 1983.</li> <li>Tarnowski Wojciech, Symulacja komputerowa procesów ciągłych, Koszalin, Wydaw. Uczelniane Wyższej Szkoły Inż., 1995.</li> <li>Zeigler Bernard P., Teoria modelowania i symulacji, Warszawa, Państw. Wydaw. Naukowe, 1984.</li> <li>Pakowski Zdzisław, Symulacja procesów inżynierii chemicznej: teoria i zadania rozwiązyane programem Mathcad, Łódź, Wydaw. Politech. Łódzkiej, 2001.</li> <li>Gierulski Wacław, Modelowanie i symulacja komputerowa :laboratorium : praca zbiorowa, Kielce, Politechnika Świętokrzyska, 1996.</li> <li>Fishman George S., Symulacja komputerowa :pojęcia i metody, Warszawa, Państw. Wydaw. Ekonomiczne, 1981.</li> </ol> <p>Supplementary literature</p> <ol style="list-style-type: none"> <li>Heermann Dieter W., Podstawy symulacji komputerowych w fizyce, Warszawa, Wydaw. Nauk.-Tech, 1997.</li> <li>Jach Karol, Komputerowe modelowanie dynamicznych oddziaływań ciał metodą punktów swobodnych, praca zbiorowa, Warszawa, Wydaw. Naukowe PWN, 2001.</li> <li>Winkowski Józef, Programowanie symulacji procesów, Warszawa, Wydaw. Nauk.-Tech., 1974.</li> <li>James A., Modelowanie matematyczne w oczyszczaniu ścieków i ochronie wód, Arkady, Warszawa 1986.</li> </ol> <p>eResources addresses</p> <p>Adresy na platformie eNauczanie: Komputerowe Wspomaganie Projektowania, Wykład, Technologia Chemiczna, 2023-24, Semestr letni - Moodle ID: 37588 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=37588">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=37588</a></p>												
Example issues/ example questions/ tasks being completed	Diethyl ether is produced by catalytic dehydration of ethanol at 450-500 K. The raw material is fed to the reactor after pre-evaporation and the gas phase is heated up to 450 K. The reactor consists of a bundle of tubes filled by a catalyst. It is assumed that the consumption of the catalyst is small amount and its presence in the stream leaving the reactor can be omitted. The product stream coming out of the reactor is pre-cooled to 345 K and separated in a distillation column where the ether is obtained as a top product. The residue (bottom product) from the first column, containing ethanol and water, is separated in the second column and the top product (containing 92% of ethanol), is recycled to the reactor. For the production of ether, rectified ethyl alcohol with 95% by weight is used. The ethanol conversion at a single pass through the reactor is 0.90, and the entire process takes place under atmospheric pressure. Draw up a diagram of the ether production and calculate a material and energy balance of the process for the production of 1500 kg/hr of the ether. Use the CHEMCAD software to draw up the material and energy balance of the process.												
Work placement	Not applicable												